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Lyapunov stability of periodic solutions of planar nonlinear systems

(joint work with Lei Jinzhi Lei, Pedro J Torres and Zhang Meirong)

We establish two important facts on periodic linear planar Hamiltonian systems. First one is the reduction from ellipticity to R-ellipticity. The second one is the relation between the stability of linear systems and the existence of periodic solutions of the generalized Emarkov-Pinney equations. As a corollary, based on the Birkhoff normal forms and the Moser twist theorem, we present sufficient conditions for the stability in the sense of Lyapunov of the equilibrium of a nonlinear planar system. Our results can be applied to the relativistic oscillator and do not involve small parameters.